

## 2.4 Simple Systems



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Systems manipulate signals, creating output signals derived from their inputs. Why the following are categorized as "simple" will only become evident towards the end of the course.

### 2.4.1 Sources



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Sources produce signals without having input. We like to think of these as having controllable parameters, like amplitude and frequency. Examples would be oscillators that produce periodic signals like sinusoids and square waves and noise generators that yield signals with erratic waveforms (more about noise subsequently). Simply writing an expression for the signals they produce specifies sources. A sine wave generator might be specified by  $y(t) = A \sin(2\pi f_0 t) u(t)$ , which says that the source was turned on at  $t = 0$  to produce a sinusoid of amplitude  $A$  and frequency  $f_0$ .

### 2.4.2 Amplifiers



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An amplifier (Figure 2.13) multiplies its input by a constant known as the amplifier **gain**.

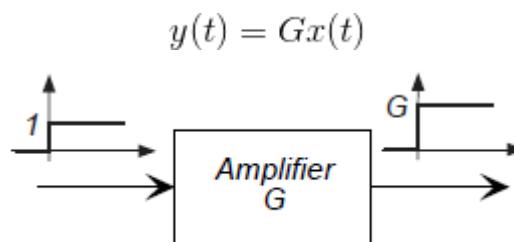


Figure 2.13 An amplifier.

The gain can be positive or negative (if negative, we would say that the amplifier **inverts** its input) and its magnitude can be greater than one or less than one. If less than one, the amplifier actually **attenuates**. A real-world example of an amplifier is your home stereo. You control the gain by turning the volume control.